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Intended for: Commonly used Non-Office ergonomic equipment

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## **Non-Office Ergonomic Equipment Issues and Recommendations**


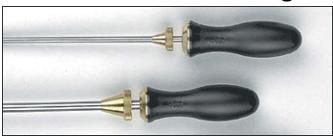
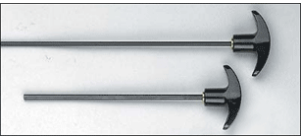



<b>PICKING UP SMALL PARTS</b>	<b>2</b>
<b>HAND TOOLS</b>	<b>3</b>
<b>OTHER TOOLS</b>	<b>7</b>
<b>CONTACT STRESS / VIBRATION</b>	<b>12</b>
<b>TAPE/CARPET LAYING, FLOOR CLEANING</b>	<b>12</b>
<b>BENDING/REACHING INTO LARGE BINS</b>	<b>14</b>
<b>ADJUSTABLE HEIGHT WORKSTATIONS</b>	<b>16</b>
<b>CARTS</b>	<b>17</b>
<b>STEPS AND LADDERS</b>	<b>18</b>
<b>CREEPERS AND STOOLS</b>	<b>21</b>
<b>LIFT ASSISTS AND LIFT SYSTEMS</b>	<b>23</b>
<b>LIFTING AND CARRYING</b>	<b>25</b>
<b>LIFTING/HOLDING TOOLS</b>	<b>26</b>
<b>DRUM AND CYLINDER HANDLING</b>	<b>28</b>
<b>LOADING/UNLOADING TRUCKS</b>	<b>29</b>
<b>MOVING EQUIPMENT</b>	<b>30</b>
<b>VISIBILITY</b>	<b>31</b>

<b>Picking up Small Parts</b>	
<p><b><i>Tweezers</i></b>          Tweezers often require repeated forceful pinch grips.</p>	<p>Evaluate option for using alternative tweezers designs to reduce forces when performing different tasks. Options to consider include:</p> <ul style="list-style-type: none"> <li>▪ Padded Tweezers</li> <li>▪ Reverse action tweezers</li> <li>▪ Low force activation</li> <li>▪ Curved tip tweezers</li> </ul> <p>Vendor sources for tweezers include:</p> <p> <a href="#">TDI International</a>  <a href="#">Excelta</a>  <a href="#">Erem</a>  <a href="#">Ideal-tek</a> </p> 
<p><b><i>Vacuum Wands</i></b>          Component handling vacuum wands (small device pick and place systems) provide an alternative to tweezers. They eliminate the forceful pinch grips. Issues that should be considered when selecting a vacuum wand include the location, size, and shape of the vacuum control button and the size/shape of the vacuum wand. Select a design that allows for use with a neutral hand/wrist/arm posture.</p>	 <p><a href="#">WandShop</a></p>  <p><a href="#">NetMotion</a></p>  <p><a href="#">Windrush Technologies</a></p>  <p><a href="#">Constant Vacuum Pick Up Tool</a></p>  <p><a href="#">Pen-Vac</a> (self-contained)</p>
<p><b><i>Pliers</i></b></p>	<p>Vendor sources include:</p>  <p><a href="#">TDI International Supreme Line</a></p>  <p><a href="#">Lindstrom</a></p>








Hand tools	
<p><b>Powered Screwdrivers</b></p> <p>Electric screwdrivers eliminate forearm rotation required with manual screwdrivers and reduce applied forces.</p>	<p>Angled/extension screwdriver bits for work in tight assembly situations and provide access to hard to reach locations. They turn the “drill into offset screwdriver”</p> <div> </div> <div> </div> <p><a href="#">Eazypower® Angle Driver</a>    <a href="#">Off-set Screwdriver Head</a></p> <p>Utilize a screwgun instead of a drill when feasible (for low force tasks). Screwguns are lighter and smaller. A couple possible options from Dewalt are:</p> <div> </div> <div> </div> <p><a href="#">DCF610S2</a>    <a href="#">DW920K-2</a> Two Position</p> <p>The DCF610S2 has LED lights to enhance visibility.</p> <p>Adjustable torque and/or push to start electric screwdrivers. Vendor sources include:</p> <div> </div> <p><a href="#">Aimco Eletctra Lever</a></p> <p><a href="#">Flexible Assembly</a> offers a wide variety of adjustable torque screwdrivers from vendors including Ingersoll Rand, Delta Regis, and Sumake.</p>
<p><b>Cable Lacing and Wire Threading Tools</b></p> <p>A variety of hand tools are available for performing wire threading and pulling tasks. The tools provide a means to perform the task more quickly by increasing grip and reach capabilities.</p>	<p>Work with employees to review possible hand tool options from catalogs specific for the types of tasks they are performing. Example tools are shown below.</p> <div> </div> <div> </div> <p><a href="#">Menda Harnessing Wire Threader</a>    <a href="#">Wire Loop Puller</a></p>

	  <p><a href="#">Jonard Cable Lacing Needle</a>      <a href="#">Cable Ring Tool</a></p>
<p><b>Crimpers</b></p> <p>Crimping tasks require high hand force exertions. Employees often have difficulty performing manual crimping tasks with one hand and attempt to find a space for leverage for one side of the crimp handle. For tasks where manual crimpers cannot be eliminated, alternative crimper designs that offer reduced hand forces and bracing edges should be considered.</p> <p>Ideally, pneumatic or other powered crimpers should be provided.</p>	 <p><a href="#">Thomas &amp; Betts Sta-Kon® ERG-4001</a> (Manual)</p>   <p><a href="#">DMC Pneumatic Crimp Tool</a>      <a href="#">DMC HXE4</a></p>
<p><b>Turning Valves</b></p> <p>Employees often manually turn wheel valves. The valves are often located in hard to reach locations that are difficult to access. This leads to awkward postures and extended reaches while performing forceful exertions.</p>	  <p><a href="#">Gearench Wheel Wrenches</a>      <a href="#">Reed Valve Wheel Wrenches</a></p>
<p><b>X-ACTO Knife</b></p> <p>Use of X-ACTO knives and other cutting tools often require high force pinch grips and contact stress from knurled metal surfaces on the handle.</p>	<p>Ensure that employees have access to replacement blades as needed. This will reduce required forces during use and increase quality.</p> <p>Consider providing padding for existing tools or purchase padded tools to eliminate contact stress and increase handle diameter.</p>  <p><a href="#">X-ACTO Gripster™ Knife</a></p>

<p><b><i>Dremel</i></b>          Consider power tools such as a Dremel to reduce hand forces and the overall time required to perform hand tool tasks.</p>	 <p><a href="#">Dremel VersaTip™ Soldering and Hot Knife</a></p>  <p><a href="#">Dremel 200, Rotary Tool Kit</a></p>
<p><b><i>Extraction Tool</i></b>          There is often limited finger clearance around electrical component covers and plugs for finger access when gripping the plug during removal. An extraction tool replaces a restricted pinch grip with a power grip.</p>	 <p><a href="#">Lindstrom Extraction Tool</a></p>
<p><b><i>Wire/Cable Bending Tools</i></b>          Bending tools can reduce the force and duration (and likely also improve postures) of wire dressing and cable management tasks.</p>	 <p><a href="#">Ratchet Cable Bender</a></p>  <p><a href="#">Hydraulic Cable Bender</a></p>
<p><b><i>Wrench</i></b></p>	<p>Code Blue Handles are the newest handle option from CHANNELLOCK®. They have a “Santoprene core with TRP-rubber overmold ... for comfort and secure grip.”</p>  <p><a href="#">CHANNELLOCK® 430-CB Code Plier</a></p>

<p><b>Scrubbing</b></p> <p>Pipe cleaners have a wire thin handle which requires a pinch grip. They are often used at LANL to clean out the inside of equipment. Issues with use include repetitive pinch grips and awkward wrist postures.</p>	<p>Consider providing a cleaning rod with a handle that can be grasped with a power grip. Vendors of gun cleaning equipment offer both “t” handled options and contoured cylindrical options. Possible sources are shown below.</p>  <p><a href="#">Gunslick® Cleaning Rods</a></p> <p>A wide variety of rod-adapters, brushes, mops, and tips are available to <a href="#">accessorize</a> the rods.</p> <p>Other vendors of cleaning rods include:</p>   <p><a href="#">KleenBore®</a></p>  <p><a href="#">Tipton</a></p>
<p><b>Air Compressor Use</b></p>	<p>It is recommended that the employees check with the vendor of their specific model of air compressor to determine what attachment options are available for operation with a foot pedal.</p> <p>Two examples of foot pedal switches for use with an air compressor are shown below.</p>  <p><a href="#">Speed Control Foot Pedal</a></p>  <p><a href="#">Air compressor foot control</a></p>



<b>Other Tools</b>	
<p><b>Trigger Use on Aerosol Cans</b>            Spray grip handles for use with aerosol cans to reduce force and contact stress.</p>	 <p><a href="#">Rust-oleum Aerosol Spray Grip</a></p>
<p><b>Cutting Very Thin Sheet Metal</b>            Reduce reaches and pull forces required on manual guillotine cutters.</p>	<p>Evaluate electric/automatic cutter options.</p>  <p><a href="#">Footpedal Guillotine Sheet Cutter</a></p> <p>Consider alternative large format manual cutter designs such as the MBM shown below.</p>  <p><a href="#">MBM</a></p> <p>Retrofit the handle on the existing cutter so that it can be accessed closer to the body and pulled down with both hands similar to the Swingline design shown below.</p>  <p><a href="#">Swingline</a></p>
<p><b>Removing Labels</b>            Eliminate or reduce repetitive forceful exertions required while using a manual hand scraper.</p>	 <p>Sticker Removal Tool <a href="#">Wonder Wheel</a></p>
<p><b>Paint Brushes</b></p>	<p>Two sources of paint brushes with alternative handle designs include:</p>  <p><a href="#">Pistol Grip</a></p>  <p><a href="#">Proform</a></p>

### ***Opening Bottles and Jars***

#### **Manual Lid Removers**

Most commercially available tools work on lids with a maximum diameter of 3.5" to 4".



[OXO Good Grips](#)



[Swing-A-Way Comfort Grip](#)

#### **One-Handed Manual Lid Remover**

For use on larger bottles/jars, another option is a one-handed jar opener base combined with a non-slip gripper to reduce hand forces.



[SoloGrip One-Handed Jar Opener](#)



[Dycem Non-Slip Cone-Shaped](#)

4-1/2" Diameter



[Screwy Lewy](#)


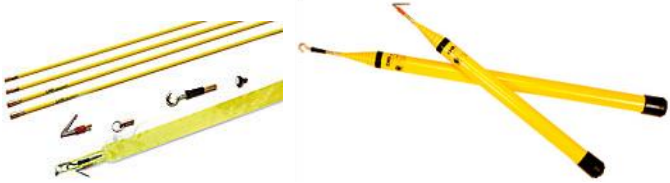
6" Diameter

#### **Electric Lid Remover**












[Black & Decker Lids-Off Jar Opener](#) JW200

- Adjustable height and large release button
- Fits jars up to 4-1/2" in diameter and 8" high
- Measures 8-1/2" wide by 7-3/4" deep by 10" high

<p><b>Reaching Items on Shelves and Floor</b></p>	<p>Reachers are available from a variety of sources including <a href="#">North Coast Medical</a> and <a href="#">AliMed</a>. An example is shown below.</p>  <p><b>PikStik Reacher</b></p> <ul style="list-style-type: none"> <li>• Jaws open to 5½" by squeezing the trigger</li> <li>• Jaws rotate 90° in any direction, allowing objects to be picked up at any angle.</li> <li>• The tips feature a nonslip, textured surface.</li> <li>• Features a hanging loop for easy storage.</li> <li>• Available in three lengths: 20", 26", or 32"</li> </ul>
<p><b>Electrical Reach Tools</b></p> <p>Electrical utilities use a variety of 'hot sticks' for grasping and manipulating live electrical equipment. The fiberglass handles used for electrical insulation also reduce tool weight.</p> <p>Heavier grade 'reachers' are also available.</p>	 <p>Example <a href="#">push/pull rod cable management tools</a>. Standard rods and attachments (left) and heavy duty telescoping poles (right).</p> <p>Additional Vendor Sources  <a href="http://www.aplussafety.net/hot_sticks.cfm">http://www.aplussafety.net/hot_sticks.cfm</a>  <a href="http://www.whsalisbury.com/catalog/hotsticks/catalog.htm">http://www.whsalisbury.com/catalog/hotsticks/catalog.htm</a>  <a href="http://burlingtonsafety.thomasnet.com/viewitems/hot-sticks-tools/hot-sticks?&amp;forward=1">http://burlingtonsafety.thomasnet.com/viewitems/hot-sticks-tools/hot-sticks?&amp;forward=1</a>  <a href="http://www.mcmaster.com/">http://www.mcmaster.com/</a> (keyword: 'easy reachers')</p>
<p><b>Decanting Bottles</b></p> <p>When working at fume hoods, employees often lift and hold a full bottle of liquid with an extended reach while performing a controlled pour of the contents.</p>	<p><b>Bottle Tilting Device</b></p> <p>A custom made bottle tilting device that supports the weight of the bottle during tipping should be evaluated. This may also improve the process by providing steady decanting that does not disturb the sediment in the bottom of the bottle. One possible option to try is the bottle decanter shown below. Custom modifications to the top section of this design may be required to accommodate the larger size of the bottle opening.</p>

	<div> </div> <div> </div> <div> <p><a href="#"><u>The Pour Thing</u></a></p> </div> <div> <ul style="list-style-type: none"> <li>• Comes in 2 liter (soda bottle) or a 1 gallon (milk) version.</li> </ul> </div> <div> <p>For applications where an adaptation of <i>The Pour Thing</i> above doesn't work, a smaller version of the 5 gallon tilt stand design shown below could be used to create a prototype.</p> </div> <div> </div> <div> <p><a href="#"><u>Champ 5 Gallon Can Tilt Pouring Holder</u></a></p> </div>
<p><b><i>Dispensing With Bottle Pumps</i></b>          Above shoulder forceful exertions with extended reaches are required when using the 50 ml and 100 ml bottle pumps. Employees note that more force is required to use the 100 ml than the 50 ml. To reduce the stress of the pumping task, employees often use the 50 ml pump twice instead of the 100 ml pump.</p>	<p>Alternative Bottle Dispenser Pump Designs          Spring loaded dispensers minimize the force required to depress the pump. Possible options:</p> <div> </div> <div> <p><a href="#"><u>Stuart Pressmatic</u></a></p> </div> <div> </div> <div> <p><a href="#"><u>Seripettor Pro</u></a></p> </div> <p>Consideration should also be given to use of automated dispensers such as those shown below.</p> <div> </div> <div> </div> <div> <p><a href="#"><u>OmniSpense® ELITE Peristaltic Pumps</u></a> (left)  <a href="#"><u>Hirshmann Opus Motorized Dispenser</u></a> (right)</p> </div>

	<p>Long term: Bulk dispensing Brandtech® Scientific offers a <a href="#">Remote Dispensing System</a> that works with its Dispensette® III or Dispensette® Organic bottle top dispensers. This allows for remote dispensing from drums and bulk containers up to 30 feet away. A quick release connector with integrated valves simplifies switching out bulk containers</p>  <p><a href="#">BrandTech® Scientific Inc. Dispensette III</a></p>
<p><b>Tool Lubricant Spills</b> Machine shop equipment often requires the use of tool lubricants. As the equipment ages, the amount of lubricant that leaks onto the surrounding floor often increases. Employees frequently attempt to restrict the area impacted by the fluid with rags that do not completely absorb the liquid.</p>	<p>Perform preventive maintenance on equipment to minimize the amount of leaks.</p> <p>As needed, utilize absorbent socks and pads specifically designed for absorbing the type of lubricant associated with the machine.</p>   <p><a href="#">PIG® MRO Absorbent Socks</a> and <a href="#">Pads</a></p>
<p><b>Cable Reels</b> Employees often lift a cable reel with one hand and unroll the material from the cable with the other hand. This can lead to high force one-handed lifts and awkward postures.</p>	<p>Utilize cable dispensers. Two possible options are shown below.</p>   <p><a href="#">Cable Reel Holder</a> <a href="#">CableStik</a></p>

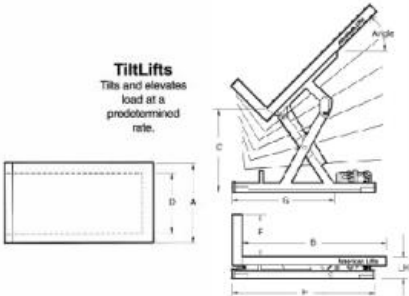




<b>Contact Stress / Vibration</b>	
<p><b>Tool Wrap</b>            Tool wrap can be used to repair older tools that have worn handles as well as to cover handles with sharp or knurled edges. It can be used to address issues of both contact stress and vibration exposure.</p>	<p>Possible Vendor Sources  <a href="#">Sorbothane® Inc.</a>  <a href="#">Viscolas, Inc.</a>  <a href="#">Grip-Tek</a>  <a href="#">Impacto</a></p> <p>Tool wrap increases the diameter of the tool handle.</p>
<p><b>Gloves</b>            As with tool wrap, gloves can be used to address issues of contact stress and vibration exposure. They also may be needed for PPE reasons (temperature or chemical exposure).</p> <p>When selecting gloves, consideration should be given to the type of task being performed. Padded gloves should provide padding in the area needed during tool use.</p>	<p>Provide gloves of a variety of sizes to ensure that employees have access to gloves that fit well to their hand size.</p> <p><a href="#">Chase Ergonomics</a>  <a href="#">Ergodyne</a>  <a href="#">Impacto</a>  <a href="#">OccuNomix</a>  <a href="#">Duluth Trading</a>  <a href="#">IronClad</a></p>
<b>Tape/Carpet Laying, Floor Cleaning</b>	
<p><b>Tape Laying</b>            Laying out marking tape on the floor often requires employees to use awkward postures of the neck and back as well as extended and across body reaches and crouching/kneeling postures.</p> <p>Employees use forceful hand exertions to press the tape in place once it has been laid. Tape rollers can be used to press the tape in place reducing forceful exertions and reach distances.</p>	<p>Devices are available that enable employees to roll out tape from a standing position.</p> <p> <a href="#">Vestil Manufacturing Floor Tape Applicator</a></p> <p></p> <p><a href="#">Crane Floor Covering Tools</a> <a href="#">Silicon Pastry Roller</a> <a href="#">Dough Scraper</a></p>
<p><b>Cutting Tape and Carpet</b>            Employees often use scissors to cut tape and the ends of carpet. The handles on the scissors are often metal. The blades on the scissors are often dull and not designed for cutting tasks such as carpet. Contact stress is often noted during the high hand force task of cutting carpet.</p>	<p>Options include a carpet loop pile cutter and alternative scissor designs.</p> <p> <a href="#">Crane Floor Covering Tools</a></p> <p> <a href="#">Kai 240 Power Shear</a></p>

<p><b><i>Alternatives to Kneeling</i></b></p> <p>Carpet installation tasks require kneeling on the floor. Employees frequently report contact stress in the knees, shins, and hips. Knee pads are sometimes worn by employees, but the feedback is that the pads do not stay in place since employees are not stationary when performing the task.</p>	<p>Consider a kneeling creeper with chest support.</p> <div> </div> <div> </div> <div> </div> <div> <p><a href="#">RACATAC</a></p> </div> <div> <p><a href="#">Impacto</a></p> </div>
<p><b><i>Sanding</i></b></p> <p>Preparing the surface often requires the use of some type of hand sander. Holding sandpaper in the hand or with a small dispenser can lead to high force pinch grips.</p>	<p>Evaluate options for manual sanding equipment that allows for use of a power grip. Options include pole sanders which allow for a more upright posture during use on floor level tasks.</p> <div> </div> <div> </div> <div> <p><a href="#">Ace Hardware</a> <i>Hand and Pole Sanders</i></p> </div>
<p><b><i>Mopping</i></b></p> <p>The primary risk factors associated with mopping include repetitive, asymmetric motions, sometimes forceful motions, and grip forces.</p>	<p>Experiment with alternative handle designs (which may or may not be acceptable to users based on personal preferences and task requirements).</p> <div> </div> <div> </div> <div> <p><a href="#">Adjustable Handles</a></p> </div> <div> <p><a href="#">Smart Handle Pro Swivel</a></p> </div>



<b>Bending/Reaching Into Large Bins</b>	
<p><b>Spacers</b> Custom designed spacers can be used to fill in the bottom section of the bin and place items at a more comfortable height for lifting in and out of the bin.</p>	<p>Utilize plastic tubs placed upside down or similar. The spacer should cover the entire space to minimize the possibility of items falling down around the edge of the spacer. The spacer should be able to support the weight of the load placed on it.</p>
<p><b>Self Rising Bins</b> A wide variety of carts with self rising bottoms are available. Retrofit self rising platforms are also an option. Ideally, the springs underneath the platform can be easily adjusted to match the weight of the items being placed in the bin.</p>	<div> </div> <p><a href="#">Spring Load Platform Cart</a></p> <div> </div> <p><a href="#">MOD Laundry Cart</a></p>
<p><b>Spring Loaded Carts</b></p>	<div> </div> <div> </div> <p><a href="#">Ergonomic Specialists Ergo-Cart and Ergo Pallet Cart</a></p> <div> </div> <p><a href="#">Southworth Dandy Leveler</a></p> <div> </div> <p><a href="#">Bishamon</a></p>



<p><b><i>Bin Tilters</i></b></p> <p>Consider a tilt table or a lift tilt table to angle the containers. Consideration should be given to horizontal reach distance when selecting a design. Some alternatives introduce foot clearance and other access issues.</p>	 <p><a href="#">American Lifts</a></p>  <p><a href="#">Pentalift</a></p>
<p><b><i>Lift Positioner</i></b></p> <p>Consider a height adjustable lift positioner. Options include cutout designs and rotating tops.</p>	 <p><a href="#">Rotating Lift Positioner</a></p>  <p><a href="#">Lift Table with Cutout</a></p>
<p><b><i>Pallet Platforms</i></b></p> <p>Parts stored on pallets on the floor results in awkward postures when lifting. Utilize pallet platforms to raise the height of parts to comfortable lifting heights. The pallet platform can be made in house from a stack of stackable pallets.</p>	 <p><a href="#">Example platform from stacked pallets</a></p>

<b>Adjustable Height Workstations</b>	
<p><b>Workstations</b></p> <p>A wide variety of adjustable height workstations are available. When selecting a workstation, consider:</p> <ul style="list-style-type: none"> <li>• Weight and size of tools and equipment that will be on the table,</li> <li>• Height range that needs to be accommodated by the table,</li> <li>• Ease of movement of the table (crank vs. powered).</li> </ul>	<p>Two possible vendor sources are shown below.</p> <div> <p><a href="#">LTW, Inc.</a></p> </div> <div> <p><a href="#">Lista Align®</a></p> </div>
<p><b>Monitor Arms and Keyboard Mounts</b></p> <p>Monitor arms should be easily adjustable and support the weight of the monitors.</p>	<p>A wide variety of vendors for monitor arms are available including <a href="#">Ergotron</a>.</p> <div> </div>
<p><b>Pedestal Stand</b></p> <p>Adjustable height pedestal stands minimize the footprint of the equipment and enable employees to quickly and easily adjust equipment heights as needed.</p>	<div> </div> <p><a href="#">Ergotech Telescopic Vertical Lift Column</a></p>

<b>Carts</b>	
<p><b>Platform Carts</b>            Platform carts are often used for moving large and/or heavy items within and between facilities. The loading heights can be low and the push/pull forces high.</p> 	<p>Review weight and dimensions of items that will be placed on the cart. Select a cart with height and width/depth dimensions that minimize reaching and bending when loading. Consider a powered cart for heavy loads or loads transferred over long distances.</p> <div style="display: flex; justify-content: space-around;">   </div> <div style="display: flex; justify-content: space-around;"> <p><a href="#"><u>Work Height Platform Cart</u></a></p> <p><a href="#"><u>Vestil Off-Road Traction Cart</u></a></p> </div>
<p><b>Height Adjustable Carts</b>            Consider height adjustable carts for movement of items that vary in size and/or are picked up at one height and placed at another.</p>	<div style="display: flex; justify-content: space-around;">   </div> <div style="display: flex; justify-content: space-around;"> <p><a href="#"><u>Powered Dandy Lift</u></a></p> <p><a href="#"><u>Wheeled Cart</u></a></p> </div>
<p><b>Tuggers</b>            Movement of carts often requires high push/pull forces. The amount of force required is dependent on the load on the cart, the type of castor, the floor surface, and the floor incline/decline.</p>	<p>Evaluate alternative caddy designs that are easier to maneuver in tight spaces. Two possible vendor options are shown below.</p> <div style="display: flex; justify-content: space-around;">   </div> <div style="display: flex; justify-content: space-around;"> <p><a href="#"><u>Power Tug</u></a></p> <p><a href="#"><u>Powered Tugger Puller</u></a></p> </div>
<p><b>Rough Terrain</b>            Movement of carts</p>	<div style="display: flex; justify-content: space-around;">   </div> <p style="text-align: center;"><a href="#"><u>DR Powerwagon</u></a></p>
<p><b>Manual Material Handling Vendor Sources</b></p> <div style="display: flex; justify-content: space-between;"> <div> <p><a href="#"><u>Dane Technologies Power Assist Solutions</u></a></p> <p><a href="#"><u>DJ Products Movers</u></a></p> <p><a href="#"><u>Power Pusher</u></a></p> <p><a href="#"><u>Appleton Movers</u></a></p> <p><a href="#"><u>Lift Products, Inc.</u></a></p> <p><a href="#"><u>Jamco Products, Inc.</u></a></p> </div> <div> <p><a href="#"><u>Alum-a-lift, Inc.</u></a></p> <p><a href="#"><u>Global</u></a></p> <p><a href="#"><u>Vestil Manufacturing Corp.</u></a></p> <p><a href="#"><u>Easy Mover</u></a></p> <p><a href="#"><u>Rack Distributor</u></a></p> <p><a href="#"><u>Warner</u></a></p> </div> </div>	

Steps and Ladders	
<p><b>Wide Standing Platform</b>            Standing with foot partially off step or straddling steps while operating a hand tool increases the chance of falls. Standing on a narrow step of a step ladder for extended periods of time can lead to discomfort in the foot/leg/back.</p> <p>When selecting a ladder, consideration should be given to the height at which it will be used, the weight limit of the ladder itself, and the actual weight of the ladders since it will need to be lifted and carried during setup and tear down.</p>	<p>If a standard ladder is used, consideration should be given to a retrofit standing platform that provides full foot support or a ladder with wider steps.</p> <div> </div> <div> <p><a href="#">Little Giant Work Platform</a></p> </div> <div> </div> <div> <p><a href="#">Little Giant Safety Steps</a></p> </div> <p>Additional Ladder Vendors:</p> <div> </div> <div> <p><a href="#">Werner Platform</a></p> </div> <div> <p><a href="#">Cotterman</a></p> </div> <div> <p><a href="#">Cramer</a></p> </div> <div> <p><a href="#">JOMY®</a> (Counter Balanced Ladder)</p> </div>
<p><b>Work Platforms</b>            If the step is used as a work platform for an extended period of time, consider an option with a wider/deeper step for comfortable standing.</p>	<p>Two possible portable work platform options are shown below. Both have a small footprint and are lightweight and easily movable from one location to another.</p> <div> </div> <div> <p><a href="#">Portable Two-step Ladder</a></p> </div> <div> </div> <div> <p><a href="#">W/large standing work area</a></p> </div>
<p><b>Single Step Platforms</b>            Single step platforms can be used to address small issues in height and/or to accommodate across a range of employee heights to allow for access to equipment at comfortable working heights.</p>	<p>A portable work platform should be sturdy but also light weight and easy to transport from one location to another as needed.</p> <div> </div> <div> <p><a href="#">Single Step</a></p> </div> <div> </div> <div> <p><a href="#">Topside Rolling Stand</a></p> </div> <div> </div> <div> <p><a href="#">Bariatric Foot Stool</a></p> </div>

### ***Ladder Transport***

Ladders often weigh 20-40 pounds and are bulky and awkward to lift and carry due to their size. Employees frequently carry the ladder in one hand and tools and other equipment in another hand.

Ideally, employees will transport the ladder using a cart. However, due to clearance and other constraints, it is often not possible to eliminate lifting and carrying of the ladder altogether.

Consider some type of ladder carrying assist device such as a handle or roller attachment.



[Strap-n-Go Ladder Handle](#)



[Guardian Step Ladder Dolly](#)

Evaluate options such as backpacks, tool belts, and tool straps to allow employees to keep their hands free when climbing up and down the ladder and moving the ladder from one location to another.



[Werner Tool Lasso](#)



[Big Lugg](#)

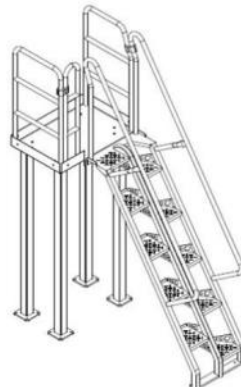
### ***Fixed Alternating Tread Stairs***

A variety of fixed ladder options are available. They are not reviewed in detail here. When deciding on the appropriate fixed ladder design, consideration should be given to associated guidelines and standards for fixed ladders. Factors that will determine the optimal design include:

- height of distance travelled,
- frequency of use,
- clearance available for access,
- tools/equipment needed when climbing the ladder.

Alternating tread stairs are an option for areas where access is limited and the depth available is not adequate for a standard set of fixed stairs.

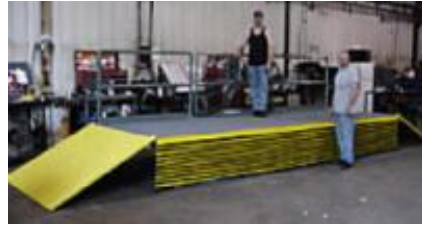
[Lapeyre Stair](#) makes a commercially available version.



***Adjustable and Fixed Step Platforms***

Fixed step platforms are another alternative. Consideration needs to be given to safety concerns. Specifically, employee awareness of the edge of the platform to avoid trips and falls.

Adjustable and fixed height options are shown below.



[Adjustable Height Platforms](#)




























[Fixed Height: Add-A-Level](#)



[Ergo-Step Stool](#)












<b>Creepers and Stools</b>	
<p><b><i>Underneath Equipment</i></b>          When an employee is required to lay down at ground level and work underneath equipment, a standard maintenance creeper provides padding, head support, and the ability to move easily.</p>	<p>Three vendor sources are shown below.</p> <div style="display: flex; justify-content: space-around; align-items: center;">    </div> <p style="text-align: center;"> <a href="#">TraXion Creepers</a>   <a href="#">Sunex Creepers</a>   <a href="#">Eidos Creepers</a> </p>
<p><b><i>Low Level Stools</i></b>          Portable low level stools provide the employee with the ability to sit when working at a low height that would normally require a crouching or kneeling posture.</p> <p>When selecting a low level stool, consideration should be given to the vertical height range of the stool. Many standard stools do not go low enough for maintenance and other tasks performed close to ground level.</p>	<p>Two vendor sources of garden tools that can be adapted for other applications are shown below.</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p style="text-align: center;"> <a href="#">Garden Rocker Rolling Seat</a>   <a href="#">Rolling Work Seat</a> </p> <p>Examples of more traditional maintenance stools are shown below.</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p style="text-align: center;"> <a href="#">Tool Caddy</a>   <a href="#">ChairMaster</a> </p> <p>If none of the low level stools go low enough, then “camp chairs” provide an alternative. They are lightweight, portable and flexible in tight spaces, and may provide postural support and contact pressure padding.</p> <div style="display: flex; justify-content: space-around; align-items: center;">    </div> <p style="text-align: center;">Example collapsible, lightweight, <a href="#">portable camp chairs</a>; some with back support, some without.</p>
<p><b><i>Low Level Creepers</i></b>          Another alternative is a low level creeper.</p>	<p>Impacto <a href="#">Stag 4</a> provides three work position options:</p> <div style="display: flex; justify-content: space-around; align-items: center;">    </div> <p style="text-align: center;">         Kneeling   Sitting   Kneeling with Upper Body Support       </p>





<p><b>PPE</b></p> <p>If the employee moves around to many locations and movement of a device is not possible or clearance is limited, personal protective equipment such as padding is another alternative.</p>	 <p><a href="#">Impacto</a> Knee Pads</p>	 <p><a href="#">ErgoKnee</a> Padding</p>
<p><b>Forward Leaning Tasks</b></p> <p>When forward leaning cannot be eliminated from a task, employees often support the weight of their body on the edge of equipment. This can lead to contact stress as well as discomfort in the back and neck from awkward seated postures. Consider forward leaning chairs.</p>	 <p><a href="#">Hag Capisco</a></p>	  <p><a href="#">Synetik</a></p>
<p><b>Portable Stool</b></p>	 <p><a href="#">Work Seats</a></p>	 <p><a href="#">Sling Seat</a></p>  <p><a href="#">Proactive Golfers</a></p>
<p><b>Sit/Lean Stand</b></p> <p>Sit/Lean stands are an option for tasks where employees frequently get up and down or where leg clearance is limited and a tall stool is not an option.</p>	 <p><a href="#">The Stand Stool</a></p>	 <p><a href="#">Tasq Standing Support</a></p>
<p><b>Over Engine Creeper</b></p> <p>Consider a movable body support for use when installing from the front of the machine or over the top of equipment. An off-the-shelf mechanics engine creeper can often be modified to provide access and support the employees' body weight while performing these types of tasks.</p>	 <p><a href="#">Foldable Topside Creeper</a></p>	 <p><a href="#">Topside Jr.</a></p>



<b>Lift Assists and Lift Systems</b>	
<p><b>Powered Lift Assists</b></p> <p>A wide variety of powered lift assists are available on the market. When selecting a lift assist, consideration should be given to the following:</p> <ul style="list-style-type: none"> <li>• ease of use of lifting mechanism</li> <li>• time it takes for the lift platform to raise and/or lower</li> <li>• clearance of the device (for picking up and placing loads)</li> </ul> <p>Often extended legs are needed at the base to balance the load but they may restrict access.</p> <ul style="list-style-type: none"> <li>• weight limits for the device</li> <li>• type of castors</li> <li>• ease of movement of the device from one location to the other</li> <li>• vertical travel of the platform</li> </ul> <p>If picking up from a pallet, does it lower to pallet height?</p>	<p>Light duty, small footprint lifts:</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p><a href="#"><u>Alum-a-lift</u></a></p> </div> <div style="text-align: center;">  <p><a href="#"><u>Genie Load Lifter</u></a></p> </div> </div> <p>Check with vendors on options to customize lifts in terms of footprint size and end effectors.</p>
<p><b>Order Pickers</b></p> <p>If items have to be picked up from multiple shelf heights, an order picker provides the ability to move the person vertically as well as the load. This eliminates the need for the employee to climb up and down a ladder while carrying a load.</p>	<p>Three vendor sources are shown below.</p> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; justify-content: space-around; width: 100%;"> <div style="text-align: center;">  <p><a href="#"><u>Crown Wave Work Assist</u></a></p> </div> <div style="text-align: center;">  </div> </div> <div style="display: flex; justify-content: space-around; width: 100%; margin-top: 20px;"> <div style="text-align: center;">  <p><a href="#"><u>Power Stocker</u></a></p> </div> <div style="text-align: center;">  <p><a href="#"><u>Vistamation</u></a></p> </div> </div> </div>

<p><b>Scissor Lifts</b></p> <p>For maintenance and other facilities activities a scissor lift might be needed. When selecting a scissor lift, job task requirements that should be considered include:</p> <ul style="list-style-type: none"> <li>• height of work areas to be accessed</li> <li>• overhead work applications</li> <li>• clearance of lift through doorways and ceiling panels</li> <li>• tool storage</li> <li>• movement of lift from one location to another</li> </ul>	<p>A wide variety of vendor sources are available. Possible options are shown below.</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p><a href="#">Sky Jack Scissor Lifts</a></p> </div> <div style="text-align: center;">  <p><a href="#">JLG Scissor Lift</a></p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: flex-start; margin-top: 20px;"> <div style="text-align: center;">  <p><a href="#">Genie Scissor Lifts</a></p> </div> <div style="text-align: center;">  <p><a href="#">Vertical Mast Lift</a></p> </div> </div>
<p><b>Other Lift Systems</b></p> <p>For some applications, a lift with an option to extend the person horizontally from the lift may be needed to allow for access around and over equipment.</p>	<p>Possible suppliers include <a href="#">LPI Lift Systems</a>.</p> <div style="text-align: center; margin-top: 20px;">  <p><a href="#">Adjustable Work Platform with Rotating Personnel Basket</a></p> </div>

<h2>Lifting and Carrying</h2>	
<p><b><i>Carrying Plywood Drywall or Similar</i></b>          Plywood boards or similar are either stored vertically or horizontally in a stack on the floor or on a pallet. Employees typically manually slide the boards out of storage and carry them to the location where they are needed. Plywood boards weigh up to 90 pounds; weights for other materials vary. Employees carry the boards with one or two people depending on the size and weight.</p> <p>In addition to the weight, the awkward size of the boards can lead to awkward postures while lifting and carrying.</p>	<p>Examples of commercially available handles and trolleys that allow for movement of the materials with a neutral posture and power grip are shown below.</p> <div>  <p><a href="#">J-Handle</a>      <a href="#">Gorilla Gripper Panel Carrier</a></p> </div> <div>  <p><a href="#">TelPro Troll</a></p> </div>
<p><b><i>Sheet Metal and Glass</i></b>          Similar to plywood, sheet metal and glass often require awkward postures, lifting of heavy weights, and possible contact stress from exposure to sharp edges. In addition, it is often difficult for employees to get an initial grip on the material and detach it from the panel below.</p>	<p>Suction cup lifters are available specifically for lifting and moving sheet metal and glass. One possible vendor source is shown below.</p> <div>  <p><a href="#">Heavy Duty Suction Cup Lifters</a></p> </div>
<p><b><i>Stacker Trucks</i></b></p>	<div>  <p><a href="#">Raymond Stacker Truck</a></p> </div>

<b>Lifting/Holding Tools</b>	
<p><b>Tool Positioners</b></p> <p>Holding a heavy power tool in place during use can lead to increased fatigue and decreased quality.</p> <p>Options for the use of gang drills and/or tool supports should be evaluated for manual drilling tasks or similar.</p>	<p>One possible solution is to provide a moving overhead rail with mounted tool arms (straight and pistol grip versions are available).</p> <p>Articulating tool arms are another alternative. Three possible sources are shown below.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p><a href="#">Aimco Ergo-Arm®</a></p> </div> <div style="text-align: center;">  <p><a href="#">BCIT Heavy Tool Support Arm</a></p> </div> </div> <div style="text-align: center; margin-top: 10px;">  <p><a href="#">Equipois ZeroG</a></p> </div>
<p><b>Tool Balancers Vendors</b></p> <p><a href="#">Powermaster, Ltd.</a></p> <p><a href="#">LK Goodwin</a></p> <p><a href="#">Hubbell Gleason</a></p> <p><a href="#">Packers Kromer</a></p>	<p><b>Torque Arms Vendors</b></p> <p><a href="#">StanleyIngersoll Rand</a></p> <p><a href="#">Nasco</a></p> <p><a href="#">GCI</a></p> <p><b>Tapping Arms Vendors</b></p> <p>FlexArm - <a href="#">Midwest Specialties</a></p> <p>Note that many of these vendors sell a variety of related products.</p>
<p><b>Manipulators</b></p> <p>Manipulators are one type of manual material handling option that can be used to lift, transfer, and hold heavy parts and fixtures in place.</p>	<div style="text-align: center;">  <p><i>World Manipulator</i></p> </div> <ul style="list-style-type: none"> <li>• <a href="#">World Manipulator</a></li> <li>• <a href="#">Advanced Manipulator</a></li> <li>• <a href="#">GT Automation</a></li> </ul>

### ***Portable Lifting Devices***

A wide variety of portable lifting devices are available to assist with positioning parts and tools while minimizing forward reach requirements.



[Portable Davit Crane](#)



[Shoplift™](#)

### ***Work Holders***

Work holders can be used to hold parts and equipment in place. These devices free up both hands for tool use. They eliminate the need to use one hand as a “fixture” to hold the part in place.



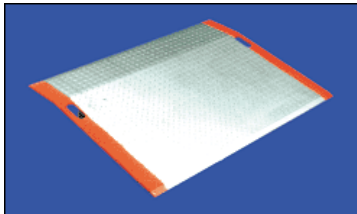


[QualCraft](#)



[Cabinet Jack](#)








<b>Drum and Cylinder Handling</b>	
<b>Handtrucks</b>	  <p><a href="#">Drum specific hand truck</a> (left)  <a href="#">Anthony Load-N-Roll Series Cylinder Cart</a> (right)</p>
<b>Drum Lifters and Tilters</b>	  <p><a href="#">Open Chute Drum Dumper</a>      <a href="#">Drum Dumper</a></p>
<b>Dewars</b>	<p>Manual cylinder carts designed for Dewars with either pneumatic or rubber castors depending on its area of use.</p>  <p>FAST ACTION ADJUSTABLE VERTICAL LIFTING HOOK (PATENT PENDING) HANDLES A LARGE VARIETY OF LIQUID CYLINDERS</p> <p>HEAVY-DUTY DOUBLE REINFORCED TUBING FRAME DESIGN</p> <p>LARGE 6" HEAVY-DUTY LOCKING SWIVEL CASTERS THAT CAN EASILY BE REMOVED FOR REPAIR OR REPLACEMENT</p> <p><a href="#">Anthony Weld cart 86U</a></p>
<b>Drum Handling Vendor Sources</b> <ul style="list-style-type: none"> <li>• <a href="#">Advanced Handling Services</a></li> <li>• <a href="#">LK Goodwin</a></li> <li>• <a href="#">Lift-o-Matic</a></li> <li>• <a href="#">Drum Runner</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Basco</a></li> <li>• <a href="#">SEI Equipment</a></li> <li>• <a href="#">Vestil Manufacturing</a></li> <li>• <a href="#">Morse Mfg</a></li> <li>• <a href="#">Wesco</a></li> </ul>

Loading/Unloading Trucks	
<p><b>Dock Plates</b></p> <p>Dock plates are often large, heavy and awkward to lift and move.</p>	<p>Evaluate alternative dock plate options. Two possible options are shown below. The one on the left is a lightweight aluminum plate with hand hold cutouts. The one on the right is a spring loaded aluminum dock plate that is mounted at the point of use.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p><a href="#">Aluminum DockPlate</a></p> </div> <div style="text-align: center;">  <p><a href="#">Spring Loaded</a></p> </div> </div>
<p><b>Dock Lift</b></p> <p>Loading of a truck outside and not located at a dock door requires employees to climb in and out of the trailers</p>	<div style="text-align: center;">  </div> <p><a href="#">Southworth Loading Dock Lift</a></p> <p>More information on these types of lifts can be found online in a <a href="#">Case Study</a> of DuraDock.</p>

<b>Moving Equipment</b>	
<p><b><i>Moving File Cabinets</i></b></p>	<p>Consider appliance hand trucks as a means to move equipment like the safe file cabinets and other heavy items. The hand truck should have built in load securing straps.</p> <div> </div> <p><a href="#">Appliance Hand Trucks</a></p>
<p><b><i>Moving Other Large/Awkward Equipment</i></b></p>	<p>Utilize furniture moving pads as a means to slide equipment rather than lifting it. Pads are commercially available, or can be homemade using a low friction, high strength material like <a href="#">Delrin®</a>.</p> <div> </div> <p><a href="#">Furniture Moving Jack and Pad Set</a></p> <div> </div> <p><a href="#">EZ Moves 4' Pull Slides</a></p> <div> </div> <p><a href="#">Amazing Sliders</a></p>



<b>Visibility</b>	
<p><b><i>Visibility of numbers on tools</i></b>                      The etchings on the torque wrench and other tools are often difficult to read.</p>	<p>It is recommended that numbers on tools be marked with something like Glo chalk as needed to increase visibility.</p> <div> </div> <p><a href="#">Keson Glo Chalk</a></p>
<p><b><i>Lighting</i></b>                      Due to equipment layout and orientation of work, lighting may be limited for many job tasks. When selecting appropriate task lighting options, the most important feature is usability. Often, unless task lighting is somehow mandated, its use will rely on employee choice and behavior.</p>	<p>Lighting type and vendor options are shown below.</p> <p><a href="#">Streamlight</a></p> <div> </div> <p><a href="#">LED Headlamp</a></p> <div> </div> <p><a href="#">Clip-On</a></p> <div> </div> <div> </div> <p><a href="#">Headlamp task lighting</a></p> <div> </div> <p>An LED construction rated <a href="#">light string</a>.</p> <div> </div> <p>Example <a href="#">gooseneck adjustable task light</a> with magnetic base.</p>

<p><b>Mirrors</b></p>	 <p><a href="#">SurePlus Safety Mirrors</a></p>  <p><a href="#">TDI International</a> Adjustable Length Inspection Mirror</p>  <p><a href="#">Ullman Inspection Mirror with Rotating Lights</a></p>
<p><b>Remote Camera Systems</b></p> <p>Remote camera systems can assist with inspection and other tasks in areas where clearance is limited. Use of these tools can often minimize the total time it takes to perform a task.</p>	 <p><a href="#">InspectorTools</a> Snake Eye Kit</p>  <p><a href="#">Envirosite</a> Quickview</p>